Claims

1. A compressor comprising a closed container which stores oil and accommodates a compressing element for compressing refrigerant and an electrically-powered element for driving the compressing element, wherein:

the electrically-powered element includes a stator and a rotor;

the compressing element includes a shaft which extends in a vertical direction and rotates, and a viscous pump which is formed inside the shaft and communicates with the oil; and

the viscous pump having a cylindrical hollow portion formed in the shaft, an insertion member coaxially and rotatably inserted into the cylindrical hollow portion, a spiral groove formed between the inner surface of the cylindrical hollow portion and the outer surface of the insertion member along a direction where the oil rises, and prevention means for preventing rotation of the insertion member.

2. A compressor as set forth in claim 1, further comprising a second viscous pump connected to the upper region of the viscous pump.

3. A compressor as set forth in claim 2, wherein the second viscous pump includes a lead groove engraved on the outer surface

of a main shaft portion of the shaft and the inner surface of a main bearing which supports the main shaft portion.

4. A compressor as set forth in claim 2, further comprising restriction means for restricting movement of the insertion member in rotational and vertical directions.

5. A compressor as set forth in claim 4, wherein the restriction means made from elastic metal wire engages with an engagement hole provided on the insertion member and includes a supporting member whose end is fixed to the stator.

6. A compressor as set forth in claim 4, wherein the restriction means includes at least one supporting member extending from the lower end of the insertion member in an almost horizontal direction, one end of the supporting member being fixed to the stator and the other end of the supporting member being rotatably connected to the end of the supporting member.

7. A compressor as set forth in claim 4, wherein the restriction means is made from elastic metal wire and engages with an engagement groove concaved on the lower end of the insertion member, the restriction means including a supporting member whose end is fixed to the lower region of the stator and a sliding portion formed by an upper bottom of the cylindrical

hollow portion and the upper surface of the insertion member.

8. A compressor as set forth in claim 1, wherein a spiral groove is formed on the inner surface of the cylindrical hollow portion along a direction where the oil rises.

9. A compressor as set forth in claim 8, wherein the spiral groove is formed by fixing a spiral component to the inner surface of the cylindrical hollow portion.

10. A compressor as set forth in claim 8, further comprising a bracket whose both ends are fixed to the lower region of the stator and whose center engages with the lower end of the insertion member to support the insertion member.

11. A compressor as set forth in claim 1, wherein the prevention means is an impeller formed on the insertion member to produce viscous resistance between the impeller and the oil.

12. A compressor as set forth in claim 11, wherein the cylindrical hollow portion is formed in a sleeve fixed to the shaft.

13. A compressor as set forth in claim 12, wherein the sleeve is substantially cylindrical and has an upper face, a top of

the insertion member being rotatably connected with the upper face of the sleeve.

14. A compressor as set forth in claim 12, wherein the sleeve is substantially cylindrical and has a bottom face, a bottom of the insertion member being rotatably connected with the bottom face of the sleeve.

15. A compressor as set forth in claim 1, wherein the prevention means includes a first permanent magnet disposed in the vicinity of the lower end of the insertion member off the rotational shaft center of the shaft and a second permanent magnet disposed such that the same poles of the first permanent magnet and the second permanent magnet are opposed to each other in the rotational direction.

16. A compressor as set forth in claim 15, wherein the second permanent magnet is directly or indirectly fixed to the closed container.

17. A compressor as set forth in claim 15, wherein the second permanent magnet is directly or indirectly fixed to the electrically-powered element or the compressing element.

18. A compressor as set forth in claim 1, wherein the prevention

means includes a first contacting member disposed in the vicinity of the lower end of the insertion member off the rotational shaft center of the shaft and a second contacting member directly or indirectly secured to the closed container or the stator and so positioned as to be opposed to the first contacting member in the rotational direction, the prevention means being provided by bringing the first contacting member into elastic contact with the second contacting member.

19. A compressor as set forth in claim 18, wherein the first contacting member and the second contacting member are disposed within the oil.

20. A compressor as set forth in claim 18, wherein an elastic body is interposed between the first contacting member and the second contacting member.

21. A compressor as set forth in claim 18, wherein at least either the first contacting member or the second contacting member is made from an elastic body.

22. A compressor as set forth in claim 18, wherein the face of the first contacting member contacts the face of the second contacting member.

23. A compressor as set forth in claim 1, further comprising a sleeve fixed to the lower region of the shaft to provide the cylindrical hollow portion, a projection formed on the outer surface of the insertion member, and a receiving portion provided on the sleeve for rotatably receiving a thrust face of the projection.

24. A compressor as set forth in claim 23, wherein the sleeve is forcedly inserted into a hollow portion provided in the lower region of the shaft and fixed to the hollow portion, the receiving portion being formed by the upper end face of the sleeve.

25. A compressor as set forth in claim 23, wherein the sleeve has a large-diameter portion and a small-diameter portion, the receiving portion being formed by a step between the large-diameter portion and the small-diameter portion.

26. A compressor as set forth in claim 25, wherein the receiving portion has a tapered thrust face shape.

27. A compressor as set forth in claim 23, wherein the insertion member is formed from one-piece synthetic resin.

28. A compressor as set forth in any one of claims 2, 8, 15, 18 and 23, wherein the electrically-powered element is driven

at driving frequencies including those equal to or lower than a power source frequency.

29. A compressor as set forth in any one of claims 2, 8, 15, 18 and 23, wherein the compressor is driven at driving frequencies including at least those in a range from 600 to 1,200 r/min.

30. A compressor as set forth in any one of claims 2, 8, 15, 18 and 23, wherein the compressing element is elastically supported within the closed container.

31. A compressor as set forth in any one of claims 2, 8, 15, 18 and 23, wherein isobutene is used as refrigerant.